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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B29D 22/00	A1	**(11) International Publication Number:** WO 97/13637
		(43) International Publication Date: 17 April 1997 (17.04.97)

(21) International Application Number: PCT/SE96/01270

(22) International Filing Date: 8 October 1996 (08.10.96)

(30) Priority Data:
9503537-4 11 October 1995 (11.10.95) SE

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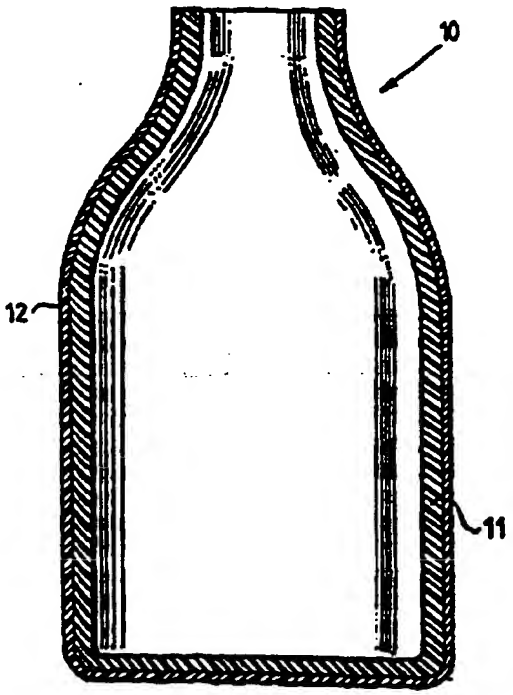
(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: CONTAINER OF POLYOLEFIN PROVIDED WITH AN OUTER PROTECTION LAYER OF POLYETHYLENE

(57) Abstract

The disclosure relates to a container of filled polyolefin plastic and a method of producing the container. In order to avoid discoloration and chafing or rubbing frictional damage on the outside of the container in connection with the container's being transported and, during transport, chafing and rubbing against other containers and against so-called roller trolleys with the aid of which stacked containers are transported, the container (10) is provided with a protective layer (12) on the outside of the container and preferably covering the whole of the outside of the container (10). According to one preferred embodiment, the container (10) is produced from a filled polypropylene, the outer protective plastic layer (12) preferably consisting of a high density polyethylene (HDPE). The thickness of the outer protective layer (12) may vary, but preferably the thickness has been selected such that the weight of the outer protective layer (12) constitutes approximately 5-30 per cent of the total weight of the container (10).



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CONTAINER OF POLYOLEFIN PROVIDED WITH AN OUTER PROTECTION LAYER OF POLYETHYLENE

TECHNICAL FIELD

The present invention relates to a container of filled polyolefin and a method of producing the container.

BACKGROUND ART

Containers of the type described in the preamble to appended Claim 1 are commercially available and are employed for such purposes as packing and transporting foods.

One such commercially available container is of the Tetra Box® type which is employed for packing and transporting fatty and oily foods, such as, for example, butter in consumer-ready portions.

The Tetra Box® container, which is of substantially trapezoidal cross section, comprises a container bottom portion with an integral bottom and side walls and a substantially planar container upper portion (or lid) with a peripheral, downwardly directed lip or edge which, with tight fit, encloses the upper edges of the side walls, thus closing the container.

The material in both the upper portion of the container and its lower portion includes a propylene based polymer and a filler, preferably particulate calcium carbonate, which is admixed to the basic polymer compound for the purposes of imparting rigidification.

The upper and lower portions of the container are produced separately by heating and thermoforming of extruded, planar webs of the polymer/filler mixture. From the thermoformed container portions, ready-filled consumer containers are thereafter produced in that the open container lower portions are filled with the pertinent product, for example butter, and are then sealed with the aid of the synchronously advanced and applied container upper portions (or lids).

It is also known in the art to pack and transport liquid foods in containers of the type described by way of introduction. One recently launched such container for cooking oil is in the form of a bottle with an integral handle and opening cap closure arrangement. The material in this prior art container includes, as in the above-described container, a propylene

based polymer with admixed filler in the form of fine particle calcium carbonate.

Thes commercial bottles are produced by a combined extrusion and blow moulding process in which a hose or tube is first extruded from the molten polymer/filler mixture. The hose or tube, while still being warm and plastically formable, is inserted between two movable mould halves which between them define a bottle-shaped mould cavity, and is cut with the aid of a hot knife which severs the hose along the upper portion of the mould halves transversely of the longitudinal direction of the hose. The two mould halves are laterally displaced, with the severed hose section retained inside the mould cavity, and a nozzle is inserted through an aperture in the upper portion of the hose section, this nozzle being in communication with a compressed air source for blow moulding of the enclosed hose section using compressed air which is blown through the nozzle. The mould halves are then separated and the blow moulded bottles are removed and transported with their associated cap closure arrangements to a filling station where the bottles are filled in a per se known manner with the relevant product, for example cooking oil, and are then sealed.

Both of the above-described prior art container types, i.e. the Tetra Box® container and the container of bottle type are easy to produce and easy to handle, and are moreover eminently suitable for rational handling on an industrial scale. Furthermore, they occasion low material and manufacturing costs, at the same time as affording to the packed product the requisite mechanical and chemical product protection. An additional valuable property is that they are produced from a material which is easy to recycle and re-use or which is easy to destroy by incineration without generating environmentally or publicly hazardous combustion products.

However, these advantages and value properties aside, the prior art containers suffer from a serious drawback which, in terms of distribution, makes such containers undesirably and unnecessarily restricted in their scope of practical application. It has namely proved that conventional so-called roller containers or roller trolleys, which are often employed for transporting containers from a filling station to a point of sale, seriously discolour the otherwise attractive, normally beautifully decorated container walls when the containers, because of unavoidable jerking and shaking

during transport, rub and chafe against one another and against the transport trolley walls.

Granted, the problem inherent in such discoloration is essentially limited to the outermost containers in each stack, but, on the other hand, the discolouring chafe and shake damage inflicted on these containers may be so serious that all such containers placed outermost run the risk of being rendered unusable after one transport run or similar handling.

The problem of transport and handling losses arising out of such discoloration to the containers may be avoided by transporting such containers in other types of transport trolleys or carriages or in transport trolleys of other materials than those employed in the conventional, galvanised roller trolleys, but since such galvanised roller trolleys are already available on the market to such a large extent, there is a major need and wish in the art to be able to employ them for the type of container of filled polyolefin under consideration here.

OBJECTS OF THE INVENTION

One object of the present invention is therefore to obviate the above-outlined problem in connection with the prior art containers.

A further object of the present invention is to realise an improved container of filled polyolefin plastic which may be transported using conventional, galvanised roller trolleys without the risk of being rendered useless or destroyed as a result of discoloration.

SOLUTION

These and other objects will be attained according to the present invention by means of a container of filled polyolefin plastic with the characterizing feature as set forth in the characterizing clause of appended Claim 1. Expedient and advantageous characterizing features of the container according to the present invention are further apparent from appended subclaims 2 to 8.

Without being limited to any scientific theory by way of explanation of the observed problem inherent in discoloration during transport in galvanised roller trolleys, one working hypothesis according to the present invention is that discoloration may occur because of a chemical reaction or inter-reaction between reactive or inter-reactive components in the material

of the container proper and in the galvanised material in the roller trolleys, respectively. For example it is known that the propylene based polymer in the container material includes at least one component, a stabiliser, of an "acidic" (low) pH, and that the galvanised material in the conventional roller trolleys includes at least one pH sensitive component, zinc oxide, which could therefore be dissolved by the "acidic" container component (the stabiliser) and cause a discoloration on the outside of the container when these components come into contact with one another, as is the case when chafing and rubbing between the containers and the trolley takes place.

Tests in accordance with the present invention have confirmed the presence of zinc oxide in the discoloration on the outsides of the container walls, even though the above-established working hypothesis need not necessarily be correct and/or complete for this reason alone in order to explain the entire mechanism operating behind the unwanted problem of discoloration.

By applying a coating of polyethylene on the outside of the container, it has surprisingly proved according to the present invention that such discoloration on the outsides of the containers may effectively be avoided, even when this coating is applied in but relatively slight coating thicknesses.

As has been intimated above, the thickness - and thereby the weight - of the polyethylene coating may be very slight, but should not be less than approximately 5 per cent of the total thickness (or length, respectively) of the container, which has proved to be a practical lower limit. A corresponding practical upper limit for the coating thickness and coating weight, respectively, may be, according to the present invention, approximately 30 per cent calculated on the total wall thickness and weight, respectively, of the container.

Furthermore, the protective coating against discoloration should, as has already been mentioned, consist of polyethylene, and to this end one particularly preferred polyethylene coating according to the present invention is a coating of high density polyethylene (HDPE) which, even at very slight coating thicknesses, is of sufficient mechanical strength and stability to be able to withstand powerful external stresses at the same time as being sufficiently chemically inert so as not to react or inter-react with soluble discolorants such as zinc oxide which occur in conventional, galvanised roller trolleys.

The polyethylene coating should be applied on the outside of the container such that it covers and protects at least those parts of the container where the risk of chafing and rubbing during transport and handling is greatest. However, the polyethylene coating is preferably applied according to the present invention in such a manner that it covers the entire outside of the container without interruption.

In accordance with one preferred embodiment of the present invention, the container is in the form of a bottle. However, as is the case in the prior art bottle, the bottle according to this preferred embodiment of the present invention may have an integrated handle so as to facilitate handling of the bottle when in use.

According to a further aspect of the present invention, there will be realised a method of producing the container according to the invention. The method according to the invention has the characterizing features as set forth in appended Claim 9. Preferred and expedient features of the method according to the invention are apparent from appended subclaims 10 to 12.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWING

The present invention will now be described and explained in greater detail hereinbelow, with the aid of a non-restrictive embodiment and with particular reference to the accompanying Drawing, in which:

Fig. 1 is a schematic cross section through a container according to one preferred embodiment of the present invention; and

Figs. 2A - 2D schematically illustrate different sequences in the method of producing a container according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENT

While the following description is presented with reference to a container in the form of a bottle, it should be observed that the present invention is not, naturally, restricted exclusively to such a given container form. It will be obvious to a person skilled in the art that the present invention may also be applied to other conceivable and commercially existing container forms, without to that end departing from the spirit and scope of the inventive concept as herein defined. Such alternative container forms, as well as obvious modifications and variations of other specifically disclosed details and components in connection with the described container

and the described method of producing the container thus lie within the spirit and scope of the inventive concept as this is defined in the appended Claims.

Referring to the Drawing, Fig. 1 thus shows a schematic cross section of a container according to the present invention in the form of a bottle. The bottle, which has been given the generic reference numeral 10, is shown without cap closure means, or any suitable top closure, which does not form any germane part of the present invention and, for which reason, has been omitted from the body of this description for purposes of clarity. Other parts and components which may normally occur in such bottles (such as handles, labels or other decorative artwork on the outside of the bottle) have been omitted for the same reason.

As is apparent from Fig. 1, the wall and bottom material in the bottle 10 has a two-ply structure comprising, on the one hand, a relatively thicker layer 11 of filled polyolefin and, on the other hand, a relatively thinner coating 12 of polyethylene which is applied on the outside of the layer 11. The relatively thicker layer 11 which constitutes the actual body of the bottle 10 here forms the inside of the bottle, while the relatively thinner coating 12 (which constitutes only a fraction of the total material thickness of the two-ply structure) forms the outside of the bottle 10.

The relationship between the thicknesses of the two material layers of the bottle, i.e. the layer 11 of filled polyolefin and the coating 12 of polyethylene, may vary within a broad range. However, the relationship is preferably chosen such that the thickness of the relatively thinner polyethylene coating constitutes between approximately 5 per cent and approximately 30 per cent of the total material thickness of the bottle 10 which, in itself, may be freely selected within broad outer limits. Examples of practical thicknesses for each respective material thickness may be approximately 30μm for the polyethylene coating 12 and approximately 300μm for the filled polyolefin layer 11, with total bottle thicknesses varying between approximately 200μm and approximately 700μm.

According to the invention, the outer polyethylene coating 12 should be applied in such a manner as to cover at least those parts of the outside of the bottle 10 which are most exposed to external stresses such as chafing and rubbing in connection with transport and similar handling. In the illustrated embodiment, the polyethylene coating 12 should therefore be applied on at

least the lower, wider portion of the bottle 10 and up to the beginning f the upper portion tapering towards the neck of the bottle. The preferably unbroken, continuous polyethylene coating 12 is ideally applied so as to cover the entire outside of the bottle 10, including the bottom of the bottle, as shown in Fig. 1.

The material in the body layer 11 of the bottle 10 should be a filled polyolefin, as in the previously described prior art bottles, and may, for example, be polyethylene or polypropylene. The preferred polyolefin material is a propylene based polymer with an admixture of particulate filler, for example calcium carbonate (chalk). The propylene based polymer may be a homopolymer or a copolymer and the expression employed "propylene based polymer" hence encompasses both homopolymers and copolymers of propylene.

Preferably, the filled propylene based polymer includes the rigidifying particulate filler in a quantity which may vary between approximately 30 and approximately 60 per cent of the total weight of the filled propylene based polymer.

The choice of filler may vary and practically applicable fillers (apart from the above mentioned calcium carbonate or chalk) may be the conventionally accepted inorganic fillers such as clay, mica, talc etc. The currently most preferred filler according to the present invention is, however, calcium carbonate which, apart from being readily available in abundance in nature, is also an economical starting material for the container according to the present invention.

The outer protective coating 12 should according to the invention, consist of polyethylene which is compatible with polyolefin in the body layer 11 of the bottle and effectively prevents dissolution of soluble discolorants of the type which occurs in conventional galvanised roller trolleys, for example zinc oxide. One particularly preferred polyethylene for the protective coating 12 is high density polyethylene (HDPE) which, even at very slight coating thicknesses, has proved capable of withstanding outer mechanical stresses at the same time as the high density polyethylene in itself is sufficiently inert or chemically neutral so as not to be influenced by such discolorants.

The bottle 10 shown by way of example in Fig. 1 is produced according to the invention in the manner schematically illustrated in Fig. 2. For purposes of clarity and in order to facilitate a comparison between Figs.

1 and 2, the same reference numerals as in Fig. 1 have been employed for corresponding or identical parts in Fig. 2.

Fig. 2A schematically illustrates a first sequence in the producti n of a container or bottle 10 in the manner according to one preferred embodiment of the invention.

Using an extruder device 13 comprising two concentric, annular nozzle outlets, a first tubular film is co-extruded from a mixture of molten polyolefin and filler, together with a second tubular film from molten polyethylene for the formation of a hose or tube 14 of two-ply structure, with the film of filled polyolefin 11 (Fig. 1) on the inside of the tube or hose 14 and the film 12 (Fig. 1) of polyethylene on the outside of the hose.

The material in the mixture of molten polyolefin and filler may be a molten polyethylene or molten propylene based polymer with admixed particulate filler of conventional type, but is preferably a molten polypropylene in which particulate calcium carbonate is admixed as the filler in a quantity of between 30 and 60 per cent of the total weight of the mixture.

The material in the outer layer of molten polyethylene preferably consists of a high density polyethylene (HDPE).

The co-extruded two-ply hose 14, while still being warm and plastically formable, is introduced into the space between two mould halves 15, 15 disposed on either side of the hose straight beneath the extruder device 13. The two mould halves 15, 15 which, in the illustrated sequence in Fig. 2A, are laterally spaced apart from one another, are laterally movable in relation to and together with one another and define between them, in the closed position (Fig. 2B), a bottle-shaped mould cavity 16 for receiving the hose 14.

When the hose 14 has reached a sufficient distance into or down in the space between the mould halves, these are compressed together in such a manner that the lower, open end of the extruded hose 14 is pressed together by the mould halves at the same time as the hose 14 at the upper portion of the mould halves 15, 15 is severed by means of a hot knife (not shown) which cuts off the hose flush with the mould halves transversely of the longitudinal direction of the hose, as shown in the second sequence in Fig. 2B.

The two united mould halves 15, 15 with the severed enclosed hose section 10 are displaced laterally in the one direction from the centre line of the hose 14. A nozzle 17 in communication with a compressed air source P is inserted into the open upper end of the hose section 10' for the aspiration of air under pressure into the enclosed hose section. When, as intimated by the downwardly directed arrows in the third sequence illustrated in Fig. 2C, compressed air is blown into the hose section 10' through the nozzle 17 sealingly abutting against the mould halves, the hose section 10' is expanded so that it fills out the whole of the bottle-shaped space or cavity 16 between the mould halves 15, 15.

The supply of air through the nozzle 17 is discontinued and the mould halves 15, 15 are laterally separated from one another, whereby the blow moulded bottle 10 may be removed from the mould halves, as illustrated in the fourth sequence in Fig. 2D.

Thus, through the above-described preferred method, it is possible in a simple manner and employing already available equipment, to produce the advantageous containers according to the present invention. Such bottles according to the invention may be employed for packing and transporting liquid foods using conventional distribution equipment, including galvanised so-called roller trolleys, with good protection afforded for the packed food and without the risk of being discoloured as a result of chafing or rubbing, as is the case in the conventional bottles consisting of filled polyolefin.

WHAT IS CLAIMED IS:

1. A container of filled polyolefin plastic, characterized in that it has a coating (12) of polyethylene applied on the outside of the container (10).

2. The container as claimed in Claim 1, characterized in that the polyethylene coating (12) covers the whole of the outside of the container (10).

3. The container as claimed in Claim 1 or 2, characterized in that the polyethylene coating (12) consists of a high density polyethylene (HDPE).

4. The container as claimed in any of the preceding Claims, characterized in that the polyolefin plastic is based on polypropylene.

5. The container as claimed in any of the preceding Claims, characterized in that the polyolefin plastic includes filler in a quantity of between 30 and 60 per cent of the total weight of the filled polyolefin plastic.

6. The container as claimed in any of the preceding Claims, characterized in that the filler comprises calcium carbonate.

7. The container as claimed in any of the preceding Claims, characterized in that the outer polyethylene coating (12) constitutes approximately 5-30 per cent of the total weight of the container (10).

8. The container as claimed in any of the preceding Claims, characterized in that it is in the form of a bottle (10).

9. A method of producing a container of filled polyolefin plastic as claimed in Claim 1, characterized in that it includes the steps of:

a) producing a tube (14) of filled polyolefin plastic which is coated on the outside with a layer of polyethylene, and

b) forming the container (10) from the tube (14).

10. The method as claimed in Claim 9, characterized in that the tube (14) is produced by co-extrusion.

11. The method as claimed in any of Claims 9 or 10, characterized in that the tube (14) is produced by blow moulding.

12. The method as claimed in any of Claims 9 to 11, characterized in that the tube (14) is formed into bottles (10).

Fig.1

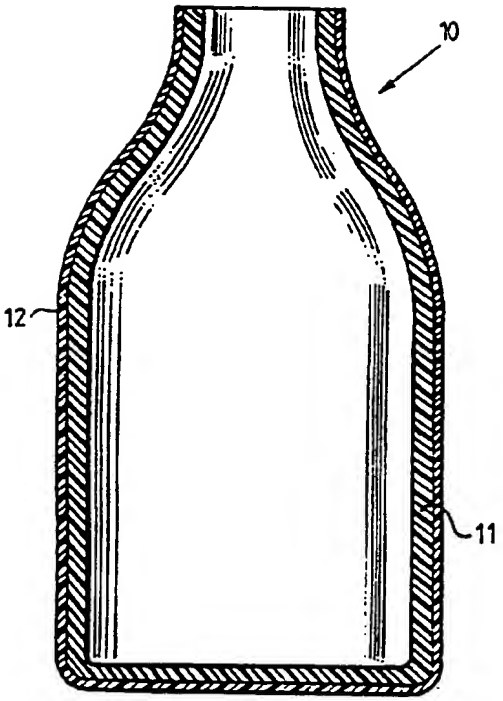


Fig.2A

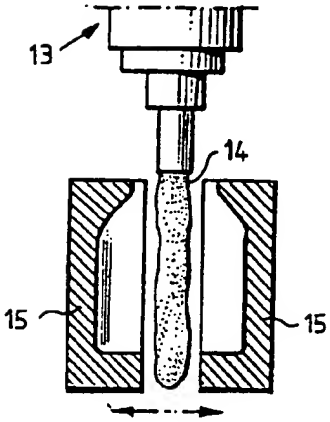


Fig 2B

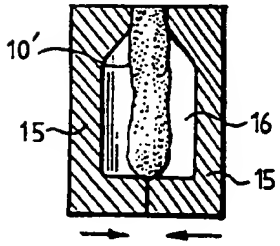


Fig.2C

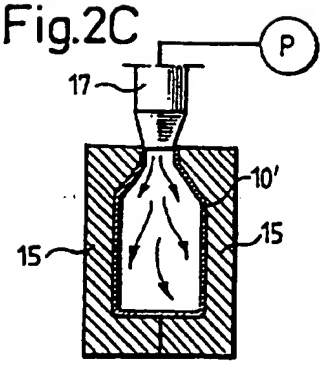
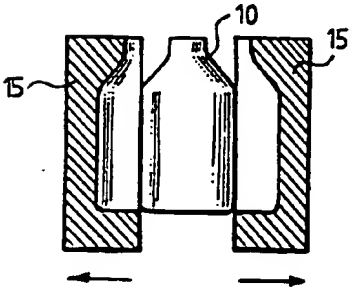


Fig 2D



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 96/01270

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B29D 22/00
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B29D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	US 5071686 A (ROGER P. GENSKE ET AL), 10 December 1991 (10.12.91), column 1, line 7 - line 38; column 1, line 55 - line 65; column 2, line 10 - line 24, abstract --	1-4,6-8
Y	US 4943458 A (HERBERT BUECHELER), 24 July 1990 (24.07.90), column 1, line 5 - line 15; column 2, line 8 - line 15; column 2, line 58 - line 60, abstract --	1-4,6-8

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 96/01270

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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